

owy bench on creek bottom, 6 Oct 1994, A. C. Sanders, T. Schram & D. Wappler 15783 (UCR); Azalea Cr. and tributary gully from west, 116°48'W, 33°52'N, T3S R2E SW/4 SW/4 S32, formerly wet soil, 6 Oct 1994, A. C. Sanders, T. Schram & D. Wappler 15780 (UCR); Azalea Cr. 1 km SW of Twin Pines Ranch buildings, road crossing just outside fence, 116°48'W, 33°52'N, T3S R2E NW/4 SE/4 S32, 1070 m, sand along creek, 4 Oct 1994, A. C. Sanders, T. Schram & D. Wappler 15774 (UCR); tributary of Azalea Cr. 1.6 km due S of Twin Pines Ranch, 116°47.5'W, 33°51'N, T4S R2E center NE/4 S5, 1130 m, 4 Oct 1994, A. C. Sanders, T. Schram & D. Wappler 15775 (UCR); Brown Cr., 0.5 km above Twin Pines Cr., 116°47.5'W, 33°53'N, T3S R2E NE/4 S29, 915 m, 4 Oct 1994, A. C. Sanders, T. Schram & D. Wappler 15772 (UCR); S of Twin Pines Rd just W of Twin Pines Ranch entrance, 116°48'W, 33°52'N, T3S R2E SE/4 NW/4 S32, wash on canyon bottom, 6 Oct 1994, A. C. Sanders, T. Schram & D. Wappler 15789 (UCR); Twin Pines Ranch Rd, drainage 1 km NW of Twin Pines Ranch, T3S R2E NW/4 S32, 1100 m, 13 Sep 1995, J. Hirshberg s.n. (UCR); seeps and drainages along road to Hungry Hollow from Hwy 243, 1.6 km E of Poppet Flat, T4S R1E NW/4 S1, 1225 m, 13 Sep 1995, J. Hirshberg s.n. (UCR). **San Bernardino County:** Mojave River just below confluence with Deep Cr., low sand bars in the river bed, not more than ten plants found, 17 Sept. 1933, D. D. Keck 2531 (Holotype: UC; Isotype: RSA!); Mojave River at Deep Creek, 3000 ft, dry sandy river bed, 18 July 1933, L. C. Wheeler 1961 (RSA). **San Diego County:** NW of Hot Spring Mtn., Chihuahua Valley, 0.3 km S of Chihuahua Valley Rd on 9S05, open mesic swale in chaparral, T9S R3E NW/4 SE/4 S17, 1270 m, 7 Dec 1995, D. L. Banks & A. Sanders 0858 (RSA); 4.2 km S of Chihuahua Valley Rd on 9S05, open mesic swale in chaparral, T9S R3E NE/4 SW/4 S21, 1200 m, 7 Dec 1995, D. L. Banks & A. Sanders 0859 (RSA); (the following all Cleveland Nat. Forest); NW Palomar Mtns., Agua Tibia Mtns., Cutca Tr., Cutca Valley, 1 km outside the Agua Tibia Wilderness, at Cutca Rd (8S08), T9S R1E SW/4 NE/4 S18, 33°23'45"N 116°55'15"W, 3460 ft, 27 Oct 1995, D. L. Banks & S. Boyd 0853 (RSA); Cutca Tr., E of Cutca V., 0.3 km from Aguanga Tr., first major drainage, T9S R1E NW/4 NE/4 S16, 33°23'33"N 116°52'27"W, 3480 ft, 2 Nov 1995, D. L. Banks, et al. 0854 (RSA); Cutca Tr., 1 km W of Aguanga Tr., T9S R1E SE/4 NW/4 S16, 33°24'41"N 116°52'40"W, 3480 ft, 2 Nov 1995, D. L. Banks, et al. 0855 (RSA); Cutca Tr., 1.3 km W of Aguanga Tr., T9S R1E SE/4 NW/4 S16, 33°23'37"N 116°53'41"W, 3520 ft, 2 Nov 1995, D. L. Banks, et al. 0857 (RSA); hills N of Warner Springs and S of Chihuahua Valley, W of Hot Springs Mtn., Indian Flats Rd (9S05), 8 km N of Highway 79, T9S R3E S/2 SE/4 S35, ca. 3900 ft, 18 Nov 1995, S. Boyd 8529 (RSA); Indian Flats Rd, stream crossing 9.1 km N of Hwy 79, T9S R3E center S35, 3820 ft, 18 Nov 1995, S. Boyd 8530 (RSA); Indian Flats Rd, entrance to Indian Flats campground, T9S R3E SE/4 SE/4 S21, 3640 ft, 18 Nov 1995, S. Boyd 8531 (RSA); Indian Flats Rd, 14 km N of Hwy 79, T9S R3E NE/4 NE/4 S34, 3850 ft, 18 Nov 1995, S. Boyd 8532 (RSA).

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*DITTRICHIA GRAVEOLENS* (ASTERACEAE), NEW TO THE CALIFORNIA WEED FLORA.—Robert E. Preston, Jones & Stokes Associates, 2600 V Street, Suite 100, Sacramento, CA 95818.

In November of 1994, I came across a nondescript composite that resembled a weedy member of the Aster tribe, while I was conducting a biological survey of the Alviso Marina in San Jose. Upon inspecting the plants, I found them to be of an unfamiliar species and collected specimens for later determination. I could not key them out using *The Jepson Manual* (Keil in Hickman (ed.), *The Jepson Manual: Higher Plants of California*, 1993), and I was ultimately unable to key them out using other North American manuals. Turning to the international floras, I found the plants to key out readily to *Dittrichia graveolens* (L.) Greuter in the Flora of New South

Wales (Brown *in* Harden (ed.), *Flora of New South Wales*, Vol. 3, 1992) and less readily in the *Flora Europaea* (Tutin et al., *Flora Europaea*, Volume 4, *Plantaginaceae to Compositae*, 1976). I confirmed the identity by comparison with specimens from the Mediterranean region at the Jepson/UC herbaria at Berkeley.

I contacted G. Douglas Barbe at the California Department of Food and Agriculture to find out if *Dittrichia graveolens* had been reported previously from California. He recalled having been sent a specimen several years ago. The late H. Thomas Harvey, professor of biology at San Jose State University, collected the species in 1984 near Alviso during his research on salt marsh ecology. He deposited his undetermined specimens with the herbarium at San Jose State University. In 1988, the late Carl W. Sharsmith, professor emeritus of botany at San Jose State, tentatively identified the specimens as *D. graveolens* and sent a duplicate specimen to the Department of Food and Agriculture for confirmation. No further action was taken on the discovery.

In November, 1995, Gail Rankin, botanist with the Santa Clara Valley Water District, called me to help identify a weedy plant that has become established in the Coyote Creek Revegetation Project at the north end of the Santa Clara Valley. The plants had first been noticed on the site around two years previously and have since spread rapidly throughout the revegetation area. I identified the plants as *D. graveolens*, based on her description, and confirmed the determination during a visit to the project site. Following this site visit, I drove to a number of other sites in the vicinity and located several other *D. graveolens* populations. The following collections encompass the currently known distribution in California, as I have been able to determine in the field and from herbarium collections (Herbaria consulted: AHUC, CAS, DAV, DS, HSC, JEPS, POM, RSA, SBBG, SD, SJSU, UC).

CALIFORNIA. Santa Clara Co.: two miles north of Alviso railroad tracks at upper edges of tidal marsh, 01 November 1984, *H. T. Harvey s.n.* (SJSU); south end of San Francisco Bay, at Alviso Marina, on banks of levee between parking lot and marina basin, elev. 1.5 m, 121°58'39"W, 37°25'49"N, Milpitas USGS 7.5' Quadrangle, 14 November 1994, *R. E. Preston 690* (DAV, UC, NY); Coyote Creek Revegetation Project, east side of levee adjacent to old Milpitas sewage disposal plant, elev. 3 m, *R. E. Preston & L. Spar 899* (DAV); northern San Jose (Alviso), in vacant lots north of State Street and west of Spreckles Street, elev. 1 m, 121°58'03"W, 37°26'00"N, Milpitas USGS 7.5' Quadrangle, 24 November 1995, *R. E. Preston 900* (DAV); Sunnyvale, Baylands Park, north side of bike path along State Route 237, elev. 2 m, 121°59'38"W, 37°24'38"N, Milpitas USGS 7.5' Quadrangle, 24 November 1995, *R. E. Preston 901* (DAV).

*Dittrichia* is classified in subfamily Asteroideae, tribe Inuleae (Bremer, *Asteraceae, Cladistics and Classification*, 1994). The genus consists of two species native to the Mediterranean region and introduced to other regions with semi-arid to semi-humid climates (Bremer 1994). Both species have been introduced into the United States, but neither appears to have become established, previously. *Dittrichia graveolens* has been collected in New York and New Jersey, and *D. viscosa* was collected on ballast in Florida, Pennsylvania, and New Jersey during the late 1800's (Herbaria consulted: TEX, GH, US, MO, NY). Cronquist (*Vascular Flora of the Southeastern United States*, 1980) noted that the Florida occurrence of *D. viscosa* does not appear to have persisted.

*Dittrichia graveolens* is an erect annual with sessile, lanceolate to linear leaves. The stems are 2 to 6 dm tall, branching above to produce a pyramidal inflorescence with many small heads in dense terminal racemes. The achenes are 2 mm long, subcylindric, pubescent with simple and glandular hairs, and abruptly narrowed at the apex, with a pappus of barbed bristles fused at the base to create a distinctive cup-like structure. *Dittrichia graveolens* superficially resembles *Aster subulatus* var. *ligulatus* and *Conyza* species but differs in having pale yellow corollas with anthers tailed at the base and being pubescent on the stems, leaves, and inflorescence with glandular hairs. These same characters serve to differentiate *Dittrichia* from *Senecio*, to which specimens key using *The Jepson Manual*. The glandular hairs store terpenes,

which gives the plant a strong characteristic odor and is the basis of the common names "stinkwort" (Australia) and "stink aster" (Europe).

*Dittrichia graveolens* is a ruderal species that grows best in disturbed areas relatively free from competition with other species (Le Floch et al. *in di Castri et al.* (eds.), *Biological Invasions in Europe and the Mediterranean Basin*, 1990). The species primarily occurs in semi-arid to semi-humid regions (400 to 800 mm annual precipitation) and can withstand drought, although it does not tolerate excessive moisture (Parsons, *Noxious Weeds of Victoria*, 1973; Le Floch et al. 1990). The seeds germinate in March or April, and flowering occurs from September to October or later, if the weather remains favorable (Brown, *The Weeds, Poison Plants, and Naturalized Aliens of Victoria*, 1909; Parsons 1973). The achenes are dispersed primarily by wind and water, but the barbed pappus bristles also promote dispersal by animals and machinery (Parsons 1973). The seeds can remain viable in the soil for up to three years (Brown 1908).

The discovery of *D. graveolens* in the south Bay Area adds to the expanding list of invasive alien plants in California (Rejmánek and Randall, *Madroño* 41:161-177, 1994). The species appears to have high potential to become a widespread weed in California. One of the best predictors of invasiveness is whether a species is known to be invasive elsewhere (Panetta, *Plant Protection Quarterly* 8:10-14, 1993). *Dittrichia graveolens*, which was first recorded in Australia in 1850, has spread throughout the southern half of the country (Parsons 1973). The species has also become one of the main invaders of overgrazed range land in north Africa (Le Floch et al. 1990). The species has become established as a weed in several other regions, including Iran and Pakistan (Oztürk 1980, cited in Wacquant *in di Castri et al.* 1990); northwestern India (Chopra et al., *Poisonous plants of India*, 2nd ed., 1965); southwestern Cape Province in South Africa (Schneider and Du Plessis, *Journal of the South African Veterinary Association* 51:159-161, 1980); and South America (Bremer 1994).

Other indicators of invasiveness are whether a species has a close relative with a history of weediness in similar habitats and whether the seeds are dispersed by wind, mammals, or machinery (Panetta 1993). In the Mediterranean Basin, *D. viscosa* is an even more widespread weed than *D. graveolens*, although *D. viscosa* does not appear to have spread as far outside of the Mediterranean region (Wacquant 1990). *Dittrichia graveolens* plants produce copious small seeds that, as noted above, are readily dispersed. The California highway system provides a convenient corridor along which the species can migrate. Two highways (Interstate 880 and State Route 237) border the infestation sites, and the main highway to the Central Valley (Interstate 680) is less than 3 km east of the Coyote Creek location.

In addition to its potential to become a serious agricultural pest, *D. graveolens* has a several characteristics that warrant classification by the California Department of Food and Agriculture as a noxious weed. *Dittrichia graveolens* has been shown to cause allergic contact dermatitis (Burry and Kloot, *Contact Dermatitis* 8:410-413, 1982). The plants produce sesquiterpene lactones (d'Alcontres et al., *Gazzetta Chimica Italiana* 103:239-246, 1973; Rustaiyan et al., *Phytochemistry* 26:2603-2606, 1987; Lanzetta et al., *Phytochemistry* 30:1121-1124, 1991), which have been shown for many other composites to be linked to allergic contact dermatitis in humans (Mitchell and Dupuis, *British Journal of Dermatology* 84:139-150, 1971). Little evidence exists that the plants are toxic, although oxalate poisoning has been reported to be associated with grazing *D. graveolens* (Lamp and Collet, *A Field Guide to Weeds in Australia*, 1979), and fishermen in southern Italy reportedly use the macerated leaves to stun fish (Lanzetta et al. 1991). Livestock deaths due to ingestion of *D. graveolens* have been linked to enteritis caused by the barbed pappus bristles puncturing the small intestine (Gardner and Bennetts, *The Toxic Plants of Western Australia*, 1956; Schneider and Du Plessis 1980).

I thank Doug Barbe, Bruce Baldwin, and John Strother for their assistance in confirming the identity of my specimens; the collection managers at the herbaria cited for searching for additional specimens from California; Gail Rankin and Linda Spar

of the Santa Clara Valley Water District for calling my attention the Coyote Creek population, taking me on a tour of their revegetation site, and providing a lead to some of the references cited; and an anonymous reviewer for helpful comments on the manuscript.

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## NOTEWORTHY COLLECTIONS

### CALIFORNIA

*EUPHORBIA DENDROIDES* L. (EUPHORBIACEAE).—Los Angeles Co., Angeles National Forest, Big Santa Anita Canyon, alt. 1000 ft., 16 Apr 1988, *Adelina Munoz* 87 (UCR); foothills above Pasadena, side canyon of Eaton Wash along New York Drive, 0.5 km N of Sierra Madre Blvd., alt. 300 m, 20 Apr 1996, *D. Koutnik s.n.* (UCR, and to be distributed).

*Previous knowledge.* Native to the Mediterranean basin and cultivated in California as an ornamental. Previously reported escaping in Santa Barbara Co. (C. F. Smith, *A Flora of Santa Barbara Region, California*, Santa Barbara Mus. of Nat. Hist., 1976), with specimens taken there at least as early as 1950, but not reported by Munz (*A California Flora*, 1959; *A Flora of Southern California*, 1974) or Koutnik (*in* J. C. Hickman, ed., *The Jepson Manual*, 1993). Also previously reported as "a well-established stand" in the foothills of the San Gabriel Mtns. near Pasadena (J. R. Brown, *Cactus and Succulent Society of America Journal*, 34:51–52, 1962). This record, which has been generally overlooked, was not documented by specimens although good photographs were provided.

*Significance.* First specimens from naturalized plants in Los Angeles County. This note serves to further document the need for addition of this species to state and regional floras.

*EUPHORBIA ESULA* L. (EUPHORBIACEAE).—Los Angeles Co., Malibu, coastal sage scrub near Malibu Creek, ca. 1 km N of the Pacific Coast Highway, 8 Oct 1992, *Scott White* 878 (UCR).

*Previous knowledge.* Native of Europe, North Africa and western central Asia, widely introduced into North America, and previously reported from northern California, with all known infestations from north of San Francisco (G. D. Barbe, *Noxious Weeds of California*, Distribution Maps, CA Dept. of Food and Agr., 1990, unpub. report; Koutnik, *in* Hickman 1993).

*Significance.* First record for Los Angeles County and southern California. A noxious weed in need of eradication.

*EUPHORBIA HIRTA* L. (EUPHORBIACEAE).—Riverside Co., Palm Desert, weed in lawns along a commercial strip on Hwy 111 between Hwy 74 and Sage Lane, 33°44'N, 116°22'W, alt. 45 m, 8 Nov 1994, *A. C. Sanders* 15864 (UCR, and to be distributed); Palm Springs, weed in lawns at a shopping center at the SE corner of Racquet Club Dr. and Palm Canyon Dr., T4S R4E center S3, alt. 200 m, 17 Mar 1996, *A. C. Sanders & G. Helmkamp* 17979 (UCR, and to be distributed); Rancho Mirage, weed in lawn at edge of Mission Hills Country Club, intersection of Dinah Shore Dr. and Duval Dr., T4S R5E NW/4 S26, alt. 100 m, 17 Mar 1996, *A. C. Sanders & G. Helmkamp* 17992 (UCR, and to be distributed).